

REMARKS

This is a full and timely response to the non-final Office Action mailed August 20, 2007. Reexamination and reconsideration in view of the foregoing amendments and following remarks is respectfully solicited.

Claims 1-40 are pending in this application, with Claims 1, 22, and 31 being the independent claims.

Rejections Under 35 U.S.C. § 102

Claims 1-3, 21, 22, 24, and 25 were rejected under 35 U.S.C. § 102(b) as 102 as allegedly being anticipated by U.S. Patent No. 5,018,096 (Pettigrew). This rejection is respectfully traversed with respect to each of Claims 1-3, 21, 22, 24, and 25.

Claims 1-3, and 21:

Claim 1 includes at least the steps of acquiring at least one engine operating parameter, calculating at least one engine residual value from said at least one engine operating parameter, normalizing said at least one engine residual value to yield at least one normalized engine residual, mapping, via a clustering technique, said at least one normalized engine residual as at least one input vector into an engine condition space having a plurality of clusters, each of said plurality of clusters representing either a normal vector engine condition or a faulty vector engine condition, identifying a closest cluster within said engine condition space, said closest cluster being closer to said at least one input vector than any other of said plurality of clusters, determining a normal engine condition for the engine undergoing analysis if said closest cluster represents a normal vector engine condition, and determining a faulty engine condition for the engine undergoing analysis if said closest cluster represents a faulty vector engine condition.

At least this combination of features is not taught, disclosed, or suggested in the art of record. For example, Pettigrew does not disclose at least the steps of calculating an engine residual value from an engine operating parameter and normalizing the engine

residual value to yield a normalized engine residual, as is recited in Applicant's Claim 1. Rather, Pettigrew discloses normalizing sampling data, and then obtaining residual values of the normalized data. (Pettigrew, at Col. 10, lines 43-53). Thus, Pettigrew discloses a series of steps that are opposite those claimed in Applicant's Claim 1, and that would thus result in a different value (namely, a residual of a normalized value) than what can be obtained using the above-referenced steps from Applicant's Claim 1 (namely, a normalization of a residual value). In addition, because Pettigrew does not disclose this type of a normalized engine residual as would result from Applicant's Claim 1, Pettigrew similarly also does not disclose the step of mapping, via a clustering technique, such a normalized engine residual as at least one input vector into an engine condition space having a plurality of clusters, as is also recited in Applicant's Claim 1. The other art of record has also been reviewed, and is not believed to make up for the deficiencies in Pettigrew.

Accordingly, for at least these reasons, Applicant's Claim 1 is patentable over the art of record. It similarly follows that Claims 2, 3, and 21 (as well as Claims 4-20 discussed below in connection with the § 103 rejection) are likewise patentable as dependent from Claim 1, as well as the additional features of these Claims.

Claims 22, 24, and 25:

Claim 22 includes at least a computer readable medium having computer-executable instructions for performing a method comprising the steps of calculating at least one engine residual parameter from data generated from a engine model and from engine operating data collected in the field from an engine undergoing analysis, normalizing said at least one engine residual value to yield at least one normalized engine residual, mapping via a clustering technique said at least one normalized engine residual as at least one input vector into an engine condition space having plurality of clusters, each of said plurality of clusters representing either a normal vector engine condition or a faulty vector engine condition, identifying a closest cluster within said engine condition space, said closest cluster being closer to said at least one input vector than any other of

said plurality of clusters, determining a normal engine condition for the engine undergoing analysis if said closest cluster represents a normal vector engine condition, and determining a faulty engine condition for the engine undergoing analysis if said closest cluster represents a faulty vector engine condition.

At least this combination of features is not taught, disclosed, or suggested in the art of record. For example, similar to the discussion above with respect to Claim 1, Pettigrew does not disclose at least a computer readable medium with instructions for performing a method comprising the steps of calculating an engine residual value from an engine operating parameter and normalizing the engine residual value to yield a normalized engine residual, as is recited in Applicant's Claim 22. Rather, as discussed in greater detail above, Pettigrew discloses normalizing sampling data, and then obtaining residual values of the normalized data. (Pettigrew, at Col. 10, lines 43-53). The other art of record has also been reviewed, and is not believed to make up for the deficiencies in Pettigrew.

Accordingly, for at least these reasons, Applicant's Claim 22 is patentable over the art of record. It similarly follows that Claims 24 and 25 (as well as Claims 23 and 26-30 discussed below in connection with the § 103 rejection) are likewise patentable as dependent from Claim 22, as well as the additional features of these Claims.

Rejections Under 35 U.S.C. § 103

Claims 4-20, 23, and 26-40 were rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Pettigrew in view of U.S. Patent No. 5,311,421 (Nomura et al.) (Claims 4-8, 15, 16, 23, and 26-29), Pettigrew in view of U.S. Patent No. 6,408,259 (Goebel et al.) (Claims 9-14, 17-20, 23, 26-29, and 31-34), or Pettigrew in view of Nomura and further in view of Goebel (Claims 30 and 35-40). These rejections are respectfully traversed with respect to each of Claims 4-20, 23, and 26-40.

Claims 4-20:

For the reasons described above in connection with the § 102 rejection, Claim 1 is patentable over the art of record. It similarly follows that Claims 4-20 are likewise patentable as dependent from Claim 1, as well as the additional features of these Claims.

Claims 23 and 26-30:

For the reasons described above in connection with the § 102 rejection, Claim 22 is patentable over the art of record. It similarly follows that Claims 23 and 26-30 are likewise patentable as dependent from Claim 22, as well as the additional features of these Claims.

Claims 31-40:

Claim 31 includes at least the steps of acquiring a plurality of engine operating parameters from a turbine engine under analysis, calculating a corresponding plurality of engine residual values by comparing each of said engine operating parameters with standard engine characteristics obtained from an engine model, computing the mean and the standard deviation of each of said plurality of engine residual values, normalizing each of said plurality of engine residual values by normalizing said mean to zero and by normalizing said standard deviation to unity to yield a plurality of normalized engine residuals, said step of normalizing using normalization factors obtained from a parameter distribution of a normally-operating baseline engine, mapping, via a clustering technique, said normalized engine residuals as input vectors into an engine condition space having a plurality of clusters, each said cluster representing either a normal vector engine condition or a faulty engine vector condition, identifying a closest cluster within said engine condition space, said closest cluster being closer to said input vectors than any other of said plurality of clusters, determining a normal engine condition for the engine under analysis if said closest cluster represents a normal vector engine condition, and determining a faulty engine condition for the engine under analysis if said closest cluster represents a faulty vector engine condition.

At least this combination of features is not taught, disclosed, or suggested in the art of record. For example, similar to the discussion above with respect to Claims 1 and 22, Pettigrew does not disclose at least the step of normalizing each of a plurality of engine residual values. Rather, as discussed in greater detail above, Pettigrew discloses normalizing sampling data, and then obtaining residual values of the normalized data. (Pettigrew, at Col. 10, lines 43-53). The other art of record has also been reviewed, and is not believed to make up for the deficiencies in Pettigrew

Accordingly, for at least these reasons, Applicant's Claim 31 is patentable over the art of record. It similarly follows that Claims 32-40 are likewise patentable as dependent from Claim 31, as well as the additional features of these Claims.

Conclusion

Based on the above, independent Claims 1, 22, and 31 are patentable over the art of record. The dependent claims are also submitted to be patentable for the reasons given above with respect to the independent claims and because each recites features which are patentable in their own right. Individual consideration of the dependent claims is respectfully solicited.

Hence, Applicant submits that the present application is in condition for allowance. Favorable reconsideration and withdrawal of the objections and rejections set forth in the above-noted Office action, and an early Notice of Allowance are requested.

If the Examiner has any comments or suggestions that could place this application in even better form, the Examiner is requested to telephone the undersigned attorney at the below-listed number.

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Reply to Final Office Action of August 20, 2007

If for some reason Applicant has not paid a sufficient fee for this response, please consider this as authorization to charge Ingrassia, Fisher & Lorenz, Deposit Account No. 50-2091 for any fee which may be due.

Respectfully submitted,

INGRASSIA FISHER & LORENZ

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